DEEP THROMBOPHLEBITIS OF THE LOWER LIMBS

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Introduction.

Deep thrombophlebitis of the lower limbs is diagnosed clinically. Phlebograms are difficult to interpret and of little practical value. Deaths from pulmonary embolism and the disability of the post-phlebitic syndrome emphasize the importance of early correct diagnosis. This paper presents the clinical findings on which was based a diagnosis of thrombophlebitis in twenty patients, records their response to treatment, and discusses the diagnosis of this disease.

The patients were unselected, other than being admitted to the Peripheral Vascular Service of the Graduate Hospital, University of Pennsylvania, over the six-month period from 1st November, 1962, to 30th April, 1963. Sixteen patients were women and four men. Patients did not predominate in any one age group, the youngest being sixteen years and the eldest being seventy-seven years.

Symptoms.

Nine of the patients had symptoms of less than two weeks' duration, three from two weeks to six months, and eight over six months.

Pain.

The commonest symptom was aching in the calves, usually more severe in one limb than the other. The patients used the words ache, tiredness, or soreness, and none referred to sharp pain. The ache was minimal or absent in the morning, increased in severity throughout the day, was aggravated by exertion, and especially by standing in one position for a prolonged period. The majority of those having symptoms of more than six months' duration had learned to obtain relief by lying down or sitting with the legs elevated. Two patients had their thrombophlebitis complicated by the symptoms of meralgia paræsthetica (Knox, 1963).

Limb Swelling

Ten patients complained of swelling of one or both lower limbs. Activity was again an aggravating factor. With bilateral swelling it was dominant in one limb. Aching calf pain was often present for some time before the onset of swelling.

Muscle Cramps.

In two patients recurrent cramps of the calf and feet muscles caused most discomfort. Unlike pain and swelling, the severity of the cramps was maximum during resting.

Signs and Method of Examination.

The signs are presented in the order of frequency in this series (see Table).

TABLE.

Signs of Deep Thrombophlebitis of the Lower Limbs.

	Stage of Therapy.				
	Admission No.	Third Day No.	Sixth Day No.	Ninth Day No.	Discharge No.
Vein Tenderness.					
Groin	11 (32)	10 (29)	6 (18)	3 (9)	0 (0)
Femoral Triangle	13 (38)	12 (35)	8 (24)	5 (15)	1 (3)
Adductor Area	24 (70)	23 (67)	19 (57)	15 (44)	11 (32)
Popliteal Fossa	9 (26)	8 (24)	8 (24)	5 (15)	1 (3)
Calf	28 (82)	27 (79)	22 (65)	21 (62)	13 (38)
Foot	4 (12)	4 (12)	2 (6)	0 (0)	0 (0)
Tibial Tenderness.					
Upper Third	19 (57)	8 (24)	2 (6)	1 (3)	1 (3)
Middle Third	23 (67)	18 (53)	13 (38)	7 (21)	1 (3)
Lower Third	22 (65)	16 (47)	14 (41)	11 (32)	5 (15)
Homan's Sign	12 (35)	9 (26)	4 (12)	1 (3)	1 (3)
Muscle Induration	8 (24)	8 (24)	3 (9)	3 (9)	1 (3)
Œdema	7 (23)	6 (18)	3 (9)	2 (6)	0 (0)

Percentages, to the nearest whole number, are stated in brackets, and based on a total of thirty-four limbs.

Selective Vein Tenderness.

The soles of the feet and behind medial malleoli were palpated to detect plantar plexus thrombosis. With the patient's knee flexed and the foot plantar flexed tenderness was sought between the relaxed bellies of the gastrocnemius muscle. Palpation was continued upwards into popliteal fossa, adductor thigh, and femoral triangle precisely over the course of the popliteal and femoral vein. Finally, pressure was applied, both lateral and medial, to the femoral pulse seeking for selective tenderness medially over the femoral vein. It was important to press not only over the course of the veins but to use a similar pressure to other areas of the limbs before deciding on the significance of this sign. In the 40 limbs examined tenderness was present in the calf in 28, in the adductor area in 24, in the femoral triangle in 13, over the femoral vein at groin level in 11, in the popliteal fossa in 9, and in the soles of the feet in 4.

Lisker's Sign (Tibial Tap Sign).

The broad subcutaneous surface of the tibia medial to the crest was percussed with the flexed fingers as in direct percussion of a chest. Bone tenderness was recorded as a positive sign. If one was in doubt as to the presence of tibial tenderness the response to tibial percussion was compared to that of patellar percussion. If the patient was equally tender to percussion in both areas one regarded the tibial response as insignificant. Twenty-six limbs had tibial tenderness. In fourteen the tenderness was evenly distributed throughout the length of the tibiæ, in ten it was more severe over the lower two-thirds of the bone, and in only two was the tenderness greatest in the upper area of the bone.

Homan's Sign.

This sign was elicited by examiner placing his left hand on the thigh above knee-level to ensure knee joint was fully extended, grasping the foot with the right hand and forcibly dorsiflexing the foot. A response of pain in the calf muscles was recorded as positive, a response of no pain or pain in any other area as negative. Twelve limbs had a positive Homan's sign.

Muscle Induration.

Calf muscle induration was assessed by two methods. By the first method one grasped the mid-leg anteriorly with the right hand and applied gentle upward pressure to the calf muscle mass with the left hand. By alternate squeezing and relaxing the mid-leg with the right hand one felt the degree of induration with the left hand. Secondly, the patient lay prone and the calf muscle mass was palpated by gentle downward pressure with the palm and fingers. Induration was detected in nine limbs.

Œdema.

Eight patients had pitting œdema. Although some had complained of swelling of both legs, in none was the œdema bilateral. Records of findings were completed on admission and no account was taken of the time of day of examination or previous activity during the same day. Both would have been significant in assessing this finding.

Skin Temperature.

This was assessed by examiner placing the back of the hand on skin of each limb. The sensitivity of one's hand to temperature could be increased by first placing the hands for a few minutes in cold water. The skin temperature was elevated in two and reduced in one. The latter had associated arterial spasm.

Pyrexia.

Two patients had temperatures above normal which subsided within four days.

Treatment.

Position and Activity.

All patients were confined strictly to bed with no bathroom privileges. The lower limbs were elevated, with an angle of twenty-five degrees to the horizontal

and a slight degree of flexion at knee-joint level. Bed rest was continued until all signs of the thrombophlebitis had disappeared or had become static, and no further improvement was expected. At this stage the patients were gradually allowed up, at first to sit in a bedside chair for one hour twice daily with legs elevated, then walk for five minutes three times daily, and finally to walk freely. Standing and dangling of the lower limbs were discouraged.

Anticoagulation.

Eighteen patients received intravenous heparin every eight hours, the dosage being 50, 75 or 100 mgs. per injection depending on individual weight and age. Because of obesity and difficulty with intravenous administration one patient received heparin subcutaneously 100 mgs. every twelve hours. The most satisfactory site for subcutaneous heparin was found to be the anterior abdominal wall, being given by the "Z" technique. One elderly patient was given 25 mgs. of heparin subcutaneously every twelve hours. Two Lee White estimations were performed, one prior to commencing heparin to alert one to the possibility of a coagulation defect, and one an hour before the third dose of heparin to exclude undue sensitivity to the drug. There was an individual variation in the duration of heparin therapy, as it was always maintained until the patient was walking without restriction. The dosage was then reduced with a twice daily, and finally a daily dose before termination.

Other Drugs.

Patients with recurrent symptoms of more than six months' duration were given two Papase tablets three times daily. These contain an extract of proteolytic enzymes from Carica papaya. Complaints of muscle cramps were relieved by either Benadryl 50 mgs. three times daily or Soma (carisoprodol) one 350 mg. tablet four times a day. Some patients received simple analgesics and sedatives for the first few days after admission.

Limb Support.

Patients with histories of limb swelling or limb œdema on admission had 4-inch crepe bandages applied from the base of the toes to knee-level. Bandages were not worn while in bed at any time, and only applied prior to patients being allowed out of bed.

Antibiotics.

One patient with an associated cellulitis received intramuscular penicillin 500,000 units eight hourly for ten days. None of the others received antibiotics.

Response to Treatment.

The twenty patients had the lower limbs examined daily by one observer and a record kept of the presence or absence of the signs already referred to. For the patients hospitalised purely for the treatment of their thrombophlebitis the average duration in hospital was nineteen days, the shortest being ten days, and the longest thirty-two days. Each of the seventeen patients' records were studied

on the third, sixth, ninth days of treatment and on the day of discharge. The response of signs to treatment is presented in the Table.

Deep Vein Tenderness.

In the third day of therapy vein tenderness showed little response, but began to disappear between the third and sixth days. This improvement continued through the ninth day and on discharge, of the twenty-eight limbs that had an initial tenderness in the calf thirteen had residual tenderness, and of twenty-four with adductor tenderness eleven had residual tenderness. In these patients the degree of residual tenderness was slight.

Lisker's Sign.

Tibial tenderness over the upper third of the bone responded more rapidly than the lower two-thirds. A small number had tibial tenderness when discharged, but, like vein tenderness, this was recorded as much improved compared with that of the initial examination.

Homan's Sign.

In the twelve limbs with a positive sign, nine were positive on the third day, four on the sixth day, one on the ninth day, and one on discharge.

Œdema and Induration.

These signs disappeared between third and sixth day and were absent from all patients on discharge.

Four of the eight patients, who had had recurrent symptoms for more than six months prior to admission, had no residual signs.

Discussion.

The diagnostic criteria for deep thrombophlebitis of the lower limbs not only varies from hospital to hospital, but between physicians in the same hospital. The frequency with which a physician diagnoses this condition depends on his degree of suspicion as to its presence, his accepted criteria, and the thoroughness of the physical examination. The "disease" may be "over-diagnosed" by some physicians, and "under-diagnosed" by others.

The association with mechanical trauma, surgery, congestive heart failure, childbirth, bacterial and viral infections, blood dyscrasiæs such as polycythæmia, ischæmic limbs, collagen diseases, and carcinoma is well known. Often thrombophlebitis is idiopathic. That the patient with idiopathic thrombosis may later develop Buerger's disease may be suspected, but in follow-up studies this is rarely true. A history of soreness of the calves, extreme tiredness of the legs in the evenings, the aggravation of these symptoms by exercise and their relief by rest should always alert one's suspicions of a thrombophlebitis. Increasing swelling of the limbs throughout the day especially of unilateral or of uneven degree between the limbs is significant. Muscle cramps of the affected limbs, or the burning pain over the lateral thigh of meralgia paræsthetica may be a presenting factor.

That these symptoms have recurred over a period of months or even years does not make the diagnosis any less probable.

As one would expect with inflammation of veins selective tenderness over their course is the commonest sign. Thrombosis confined to the plantar plexus manifested by tenderness of the soles and behind the medial malleoli can be a source of pulmonary emboli. Calf tenderness may be due to other causes than thrombosis, for example, peripheral neuropathy, herniated lumbar intervertebral disk, or ischæmic muscles. The tenderness of the ischæmic muscles is often relieved within twenty-four hours by elevating the head of the bed six inches on blocks, while phlebitic tenderness would increase. Deep limb reflexes, test of skin sensation, Lasequé's sign and Patrick's sign are a routine in examination for lower-limb pain. The association of thigh tenderness precisely over the course of the femoral vein increases the significance of calf tenderness as a sign of thrombophlebitis. In searching for selective tenderness, especially in the thigh, it is important not to press more forcibly over the suspected vein course than in the other thigh areas. Some patients are hypersensitive to palpation in any area of the limb.

Lisker's sign is a useful sign but not widely recognised. Occasionally a patient complains of persistent pain in the shin and the only positive limb finding is tibial tenderness. That this is thrombophlebitic in origin is suggested by the fact that this symptom, which may have been present for weeks or even months, is relieved by the treatment regime already described. The first patient in which this sign was suspected of being associated with thrombophlebitis was of this type and confirmed the diagnosis with pulmonary embolism and later an excellent response to therapy (Lisker, 1962). The tenderness is more common and more acute in the lower two-thirds of the tibiæ and also resists therapy longest in this area. In a traumautic thrombophlebitis bruising of the superficial tissues over the tibiæ limits the value of the sign. The underlying mechanism for the tibial tenderness has not yet been established. It is suggested that the bone tenderness is due to an increase in inter-osseous pressure resulting from venous thrombosis and obstruction of blood flow from the bone.

Homan's sign remains valuable as an aid to diagnosis. In patients accepted in this group as suffering from thrombophlebitis its frequency is less than Lisker's sign. Herniated lumbar intervertebral disk or other root affections in the lumbo-sacral area may produce a positive Homan's sign but will usually also have a positive Lasequé's sign.

Pitting œdema in thrombophlebitis is due to venous insufficiency and denotes the degree and position of venous pathways involved, as well as the presence of venous occlusion. Life-endangering thrombophlebitis may be present without œdema. A demand of œdema as an essential criterion for the diagnosis of thrombophlebitis is akin to the demand of a raised blood urea level for the diagnosis of a kidney disease.

Induration of calf muscles should be carefully sought for. Although present in only a small proportion of this series, when recognised, it indicates in the

majority an active or previous thrombophlebitis. Patients with recurrent thrombophlebitis often have hard nodular calf muscles so that maximum calf measurement on the affected limb can be less than the healthy limb.

Changes in skin temperature are of limited value. The diagnosis is not in doubt in the hot tender limb. Arterial spasm accompanying the thrombophlebitis may produce a cold limb, and infrequently a patient complains of a cold wet foot. In the cold blue swollen limb of phlegmasia cerulea dolens arterial spasm is the emergency to be dealt with. One of the patients in this series had a mild arterial spasm for twenty-four hours but no special treatment was given, relaxation occurring spontaneously.

The distribution of the signs in the limbs follows no particular pattern. It is unusual, however, to find an evenness of distribution such as to have in both limbs calf tenderness, a positive Lisker's sign, and a positive Homan's sign. A patchy distribution—for example adductor and calf tenderness with a positive Homan's sign in one limb and in the other limb calf tenderness with a positive Lisker's sign—would be more suggestive of a thrombophlebitis. Again if a calf muscle was exquisitely tender from thrombophlebitis one would expect some adductor tenderness in the same limb. In making a diagnosis one assesses the presence of the signs, their distribution, and the relation of one to the other, taking into account their degree of positivity.

The patient who has had one or more previous attacks of thrombophlebitis presents often the most difficult diagnostic problem. Many of these have residual tenderness over the course of their veins from their previous illnesses. The present investigation would suggest that in assessing this type of patient groin, femoral, popliteal or foot tenderness would indicate reactivation. Adductor and calf tenderness could be permanent sequelæ of previous damage.

Some of the patients with recurrent symptoms over months or even years gave as good response as the more acute cases. Many of these unfortunate people are mis-diagnosed as arthritis, neuritis or hypochondriacs. Others, correctly diagnosed, are told they have "to live with their symptoms" or have a crepe bandage applied. A trial of treatment as actively applied as in the acute thrombophlebitis is worthwhile and always produces relief if not a complete disappearance of symptoms. It is not the purpose of this paper to discuss fully the treatment of thrombophlebitis such as indications for long-term anticoagulation, femoral vein or inferior vena caval transection, lumbar sympathectic block, and other procedures. A method of treatment and the immediate response of the signs to this treatment has been stated. No claim is made that this is the best method of treatment. Little is known about the immediate and long-term response of thrombophlebitis to different regimes. There is much scope for the selection of types of thrombophlebitis as regards ætiology, location, and extent, and for studies of their response to various treatment regimes.

Summary.

Aching calves, swelling, and muscle cramps in the lower limbs were the presenting symptoms in twenty patients diagnosed as thrombophlebitis. The

commonest signs were selective tenderness over the veins, and tenderness of the subcutanous surfaces of the tibiæ medial to the crest. Homan's sign, induration of the calf muscles, and œdema occurred less frequently. Treatment consisted of bed rest, leg elevation, and intravenous heparin. The response to treatment was recorded by daily physical examinations by one observer. All signs showed a response, but of variable degree. Tenderness persisted in the calf and adductor areas of some patients and may be a permanent sequela. Tibial tenderness subsided more rapidly in the upper third of the bone. Four patients, who had had recurrent symptoms for over six months, gave a full response to treatment and an active approach to this type of thrombophlebitis is advised.

I thank Dr. S. Lisker, Director of the Peripheral Vascular Department of the Graduate Hospital, University of Pennysylvania, for permission to examine patients under his care and for his constant encouragement, teaching, and advice.

References.

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